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TWO NEW SESTERTERPENE LACTONES FROM A SPONGE

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Sesterterpenes, usually rare in nature, have been reported from many members of the sponge family Dictyoceratida [1-5]. The genus Ircinia has yielded a series of sesterterpene tetronic acids, the simplest of which is variabilin (1) derived from I.variabilis[1]. This tetronic acid has been found in present work together with the furan (2), previously described from I.spinosula[7], and geranyl farnesol (3)[6] in approximately equal amounts (0.7% each dry weight) from an Australian Fasciospongia (probably F.fovea). (3) has been described [6] from an insect wax containing sesterterpenes of the Ophiobalane type and the occurrence of this compound in a sponge strongly suggested that it was the precursor of Ircinia sesterterpene tetronic acids and that (2) was an immediate intermediate on the biosynthetic pathway.

Several modifications of the basic sesterterpene structure (1) have been isolated[1-4] including difurano-metabolites of which ircinin-1 (4), from I.oros, is an example [3]. We now report the separation of two new sesterterpenes from the Australian sponge Thorecta marginalis collected near Sydney, in which the tetronic acid moiety present in previously described examples was present as an unsaturated γ-lactone.

Extraction of the powdered freeze-dried sponge with dichloromethane followed by silica gel chromatography gave two major metabolites, ircinolide (5) and 24-hydroxyircinolide (6) in equal yields (0.6%) as colourless oils.

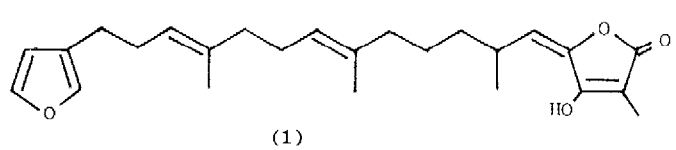
The molecular formulae (5) $C_{25}H_{28}O_4$, (6) $C_{25}H_{28}O_5$ were established by m.s. and the major fragment ions were the same for each compound (m/e 255, 161 and 81). The peaks at m/e 81 and 161 were reminiscent of the C_5-C_6 and C_{10}-C_{11} cleavages reported for (4) [3].

The ^1H n.m.r. spectrum of (5) was extremely informative and showed the resonances of the majority of protons as follows :- δ7.33, 7.26, 6.91 (1H each, bs; α-furan, C_1-H, C_4-H, C_9-H); 6.30, 5.95 (1H each, bs; β-furan, C_2-H, C_7-H); 6.08 (1H, d, J=16Hz; C_{15}-H); 5.47 (1H, d of triplets, J=16Hz, 7Hz; C_{16}-H); 5.36 (1H, bt, J=7Hz; C_{12}-H); 4.87 (1H, d, J=9Hz; C_{20}-H); 3.70 (2H, s; C_5-H); 2.84 (1H,m; C_{18}-H); 2.40-2.0 (6H,m; C_{10}-H, C_{11}-H, C_{17}-H); 1.93 (3H, s; C_{24}-H); 1.65 (3H,bs; C_{14}-H); 1.07 (3H,d,J=7Hz; C_{19}-H). Irradiation at δ2.84 collapsed the doublets at δ4.87 and 1.07 respectively to singlets, irradiation at δ5.47 collapsed the doublet at δ6.08 and a doublet appeared at δ2.12. The remaining resonance in the ^1H n.m.r. spectrum of (5) occurred as a singlet δ7.25 in accord with a proton β to a carbonyl grouping (C_{22}-H). No fine coupling was observed with C_{20}-H suggestive of the orientation shown.

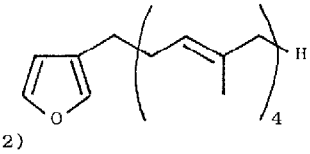
The structure (5) was further supported by the i.r. (ν max 1773 cm^{-1}; γ lactone) and u.v. spectra (λ max (MeOH), 283 nm; doubly conjugated γ lactone) and the cleavages observed at m/e 255 and 137 in the m.s.spectrum which could be rationalised as both alternative ions of a C_{17}-C_{18} scission.

The structure of (6) followed from differences in the ^1H n.m.r. and m.s. spectra when compared to those of (5). The ^1H n.m.r. spectrum was identical in general features with the exception that the the three proton singlet which appeared at δ1.93 in (5) was replaced by a two proton singlet at δ4.41 in (6). This result was paralleled by the appearance of a peak at m/e 153 ($C_8H_9O_3$) in (6), which replaced the m/e 137 ($C_8H_9O_2$) peak in (5).

The determination of absolute configuration at C_{18} awaits more material from a second collection of this sponge. The same compounds have also been detected from a small collection of an unidentified Australian sponge.



(1)



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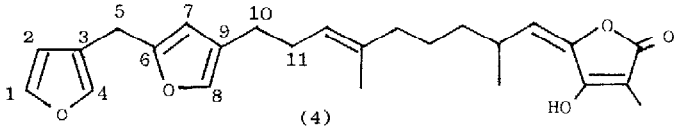

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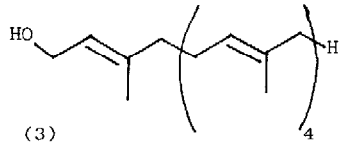
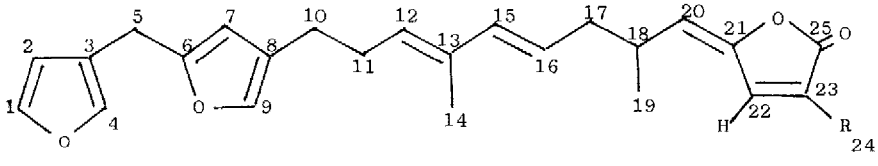


(3)



(5) R = CH_3 (6) R = CH_2OH

REFERENCES

1. D.J. Faulkner, Tetrahedron Letters,3821 (1973).
2. F. Cafieri, E. Fattorusso, C. Santacroce and L. Minale, Tetrahedron, 28, 1579 (1972).
3. G. Cimino, S. de Stefano, L. Minale and E. Fattorusso, Tetrahedron, 28, 333 (1972).
4. R. Kazlauskas, P.T. Murphy, R.J. Quinn and R.J. Wells, unpublished papers.
5. W.E. Oberhänsli and W. Hofheinz; unpublished results.
6. Tírso Rios and S. Pérez C., Chem.Commun., 214 (1969).
7. G. Cimino, S. de Stefano and L. Minale, Tetrahedron, 28, 1315 (1972).

Acknowledgements

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